Osmania University
Faculty of Informatics

Bachelor of Computer Applications (BCA)

Based on AICTE Model Curriculum

Applicable to Students Admitted from the Academic Year 2025–2026

R25 - Academic Regulations
Scheme of Instruction I - VI
Syllabi for BCA Semesters I and II

Faculty of Informatics
Osmania University
2025-2026

Dr. L.K. Suresh Kumar, CBoS, FoI

Prof K Shyamala, Dean, FoI

1350
11/12/25

Table of Contents

With effect from the academic year 2025-2026

General Course Structure

A. Definition of Credit:

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credit
2 Hours Practical (P) per week	1 Credit

B. Course code and definition:

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
Cr	Credits
CC	Core Courses
AEC	Ability Enhancement Courses
MDE	Multi-Disciplinary Elective course
VAC	Value added Courses
SEC	Skill Enhancement courses
DSE	Discipline Specific Elective
OE	Open Elective
SEE	Semester End Examinations
CIE	Continuous Internal Evaluation

Credits Table

Semester	Credits
I	21
II	21
III	24
IV	21
V	22
VI	19
Total	**128**

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BCA Program Outcomes

PO1 – Computing Knowledge:
Apply computing fundamentals and domain knowledge to solve real-world problems.

PO2 – Problem Analysis & Software Development:
Analyse requirements and design innovative software solutions.

PO3 – Modern Tool Usage:
Use modern tools, techniques, and platforms for effective computing practices.

PO4 – Communication:
Communicate clearly in technical and non-technical contexts within IT.

PO5 – Ethics & Responsibility:
Practice professional ethics and social responsibility in computing.

PO6 – Environment & Sustainability:
Recognize its impact on society and environment for sustainable solutions.

PO7 – Individual & Team Work:
Work effectively as an individual and as part of diverse teams.

PO8 – Project Management & Entrepreneurship:
Apply management and entrepreneurial skills in projects and multidisciplinary teams.

PO9 – Lifelong Learning:
Pursue continuous learning to adapt to technological advancements.

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Schemes of Semesters I and II approved for 2025-26

BACHELOR OF COMPUTER APPLICATIONS (BCA)

SEMESTER- I

SNo	Course Code	Course Title	Hours/ Week		No of Credits	Scheme of Examination			
						Max Marks		Duration(hrs)	
		THEORY	L	P	Cr	SEE	CIE	SEE	CIE
1	CC101	Mathematical Foundations of Computer Science	3	-	3	70	30	3	1
2	CC102	Computer Architecture	3	-	3	70	30	3	1
3	SEC101	Programming in C	3	-	3	70	30	3	1
4	SEC102	Web Technologies	3	-	3	70	30	3	1
5	AEC101	Effective Communication	3	-	3	70	30	3	1
PRACTICALS									
6	CC102P	Computer Architecture Lab	-	4	2	50	25	3	2
7	SEC101P	Programming in C Lab	-	4	2	50	25	3	2
8	SEC102P	Web Technologies Lab	-	4	2	50	25	3	2
		Total	**15**	**12**	**21**	**500**	**225**	-	-

SEMESTER- II

SNo	Course Code	Course Title	Hours/ Week		No of Credits	Scheme of Examination			
						Max Marks		Duration(hrs)	
		THEORY	L	P	Cr	SEE	CIE	SEE	CIE
1	CC103	Probability and Statistics	3	-	3	70	30	3	1
2	CC104	Data Structures	3	-	3	70	30	3	1
3	CC105	Operating Systems	3	-	3	70	30	3	1
4	SEC103	Object Oriented Programming using Java	3	-	3	70	30	3	1
5	VAC101	Indian Constitution	3	-	3	70	30	3	1
PRACTICALS									
6	CC104P	Data Structures Lab	-	4	2	50	25	3	2
7	CC105P	Operating Systems Lab	-	4	2	50	25	3	2
8	SEC103P	Object Oriented Programming using Java Lab	-	4	2	50	25	3	2
		Total	**15**	**12**	**21**	**500**	**225**	-	-

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With effect from the academic year 2025-2026

Tentative Schemes III to VI Semesters, to be approved

SEMESTER-III

SNo	Course Code	Course Title	Hours/ Week		No of Credits	Scheme of Examination			
						Max Marks		Duration (hrs)	
THEORY			**L**	**P**	**Cr**	**SEE**	**CIE**	**SEE**	**CIE**
1	CC201	Database Management Systems	3	-	3	70	30	3	1
2	CC202	Software Engineering	3	-	3	70	30	3	1
3	CC203	Applied Mathematics	3	-	3	70	30	3	1
4	SEC201	Python Programming	3	-	3	70	30	3	1
5	VAC201	Environmental Science	3	-	3	70	30	3	1
6	DSC201*	Professional Elective - I	1	4	3	70	30	3	1
PRACTICALS									
6	CC201P	Database Management Systems Lab	-	4	2	50	25	3	2
7	CC202P	Software Engineering Lab	-	4	2	50	25	3	2
8	SEC201P	Python Programming Lab	-	4	2	50	25	3	2
		Total	**16**	**16**	**24**	**500**	**225**	-	-

SEMESTER-IV

SNo	Course Code	Course Title	Hours/ Week		No of Credits	Scheme of Examination			
						Max Marks		Duration (hrs)	
THEORY			**L**	**P**	**Cr**	**SEE**	**CIE**	**SEE**	**CIE**
1	CC204	Entrepreneurship and Startup Ecosystem	1 1(T)	-	2	70	30	3	1
2	CC205	Computer Networks	3	-	3	70	30	3	1
3	CC206	Design and Analysis of Algorithm	3	-	3	70	30	3	1
4	CC207	Artificial Intelligence	3	-	3	70	30	3	1
5	SEC202	Design Thinking and Innovation	3	-	3	70	30	3	1
6	DSC202*	Professional Elective - II	1	4	3	70	30	3	1
PRACTICALS									
7	CC205P	Computer Networks Lab	-	4	2	50	25	3	2
8	CC207P	Artificial Intelligence Lab	-	4	2	50	25	3	2
		Total	**15**	**12**	**21**	**500**	**225**	-	-

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SEMESTER-V

S. No.	Course Code	Course Title	Hour /Week		No. of Credits	Max Marks		Duration (hrs)	
		THEORY	**L**	**P**	**Cr**	**SEE**	**CIE**	**SEE**	**CIE**
1	DSE301*	Professional Elective – III	3	0	3	70	30	3	1
2	DSE302*	Professional Elective – IV	3	0	3	70	30	3	1
3	DSE303*	Professional Elective – V	3	0	3	70	30	3	1
4	SEC301	Quantitative Techniques	2	2	3	70	30	3	1
5	SEC302	Internship/Capstone Project		8	4	50	25	3	1
6	SEC303	Major Project (Evaluation in the 6th Semester)	-	-	0	-	-	-	-
		PRACTICALS							
7	DSE301P*	Professional Elective – III Lab	0	4	2	50	25	3	2
8	DSE302P*	Professional Elective – IV Lab	0	4	2	50	25	3	2
9	DSE303P*	Professional Elective – V Lab	0	4	2	50	25	3	2
		TOTAL	**11**	**22**	**22**	**480**	**220**	**-**	**-**

SEMESTER-VI

SNo	Course Code	Course Title	Hr/week		No. of Credits	Duration (hrs)		Max Marks	
		THEORY	**L**	**P**	**Cr**	**SEE**	**CIE**	**SEE**	**CIE**
1	CC301	Generative AI	2	0	2	70	30	3	1
2	DSE304*	Professional Elective - VI	3	0	3	70	30	3	1
3	DSE305*	Professional Elective - VII	3	0	3	70	30	3	1
4	AEC301	Soft Skills	-	-	1	70	30	3	1
5	SEC304	Major Project (Initiated in the 5th Semester)	-	8	4	100	50	3	2
		PRACTICALS							
6	CC301P	Generative AI Lab	0	4	2	50	25	3	2
7	DSE304P*	Professional Elective – VI Lab	0	4	2	50	25	3	2
8	DSE305P*	Professional Elective – VII Lab	0	4	2	50	25	3	2
		TOTAL	**8**	**20**	**19**	**530**	**245**	**-**	**-**

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Proposed Streams with Discipline-Specific Electives (DSE)

1. Data Science

Sl.No	Semester	Course Code	Professional Elective
1	III	DSE*201	Basics of Data Analytics using Spreadsheet
2	IV	DSE*202	Data Visualization
3	V	DSE301	Introduction to Data Science
4	V	DSE302	Time Series Analysis
5	V	DSE303	Machine Learning
6	VI	DSE304	Big Data Analytics
7	VI	DSE305	Exploratory Data Analysis
8	VII	DSE401	Business Intelligence & Analytics
9	VII	DSE402	Data Mining & Warehousing

2. Artificial Intelligence & Machine Learning

Sl.No	Semester	Course Code	Professional Elective
1	III	DSE*201	Feature Engineering
2	IV	DSE*202	Introduction to ML
3	V	DSE301	Neural Network
4	V	DSE302	Digital Image Processing
5	V	DSE303	Natural Language Processing
6	VI	DSE304	Deep Learning for Computer Vision
7	VI	DSE305	Predictive Analysis
8	VII	DSE401	Explainable AI
9	VII	DSE402	Evolutionary Algorithm

3. Full Stack Development

Sl.No	Semester	Course Code	Professional Elective
1	III	DSE*201	Web Programming -I
2	IV	DSE*202	Web Programming -II

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Syllabi of Semesters I approved for 2025-26

BACHELOR OF COMPUTER APPLICATIONS (BCA)

SEMESTER- I

SNo	Course Code	Course Title	Hours/ Week		No of Credits	Scheme of Examination			
						Max Marks		Duration(hrs)	
		THEORY	L	P	Cr	SEE	CIE	SEE	CIE
1	CC101	Mathematical Foundations of Computer Science	3	-	3	70	30	3	1
2	CC102	Computer Architecture	3	-	3	70	30	3	1
3	SEC101	Programming in C	3	-	3	70	30	3	1
4	SEC102	Web Technologies	3	-	3	70	30	3	1
5	AEC101	Effective Communication	3	-	3	70	30	3	1
PRACTICALS									
6	CC102P	Computer Architecture Lab	-	4	2	50	25	3	2
7	SEC101P	Programming in C Lab	-	4	2	50	25	3	2
8	SEC102P	Web Technologies Lab	-	4	2	50	25	3	2
		Total	15	12	21	500	225	-	-

S. No.	Name of the Member	Signature
1	The Dean, Faculty of Engineering, OU	
2	The Dean, Faculty of Management, OU	
3	The Dean, Faculty of Commerce, OU	
4	The CBoS in CSE, OU	
5	The CBoS in Informatics, OU	
6	The Chairperson, Board of Studies in Commerce, OU	
7	Dr.B.Sujatha, Asst. Professor, Dept. of CSE, UCE, OU	
8	Dr.M.A.Hameed, Asst. Professor, Dept. of CSE, UCE,OU	
9	Mrs.E.Pragnavi, Asst. Professor, Dept. of CSE, UCE, OU	

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BCA SEM I – THEORY		Hours /Week		Cr	Scheme of Examination			
					Max Marks		Duration (hrs)	
Course Code	Course Title	L	P		SEE	CIE	SEE	CIE
CC101	Mathematical Foundations of Computer Science	3	-	3	70	30	3	1

Course Objectives

1. To introduce the fundamentals of logic, proof techniques, and set theory as a basis for mathematical reasoning and problem solving.
2. To understand relations, functions, and counting principles including the pigeonhole principle and inclusion-exclusion principle.
3. To develop the ability to solve problems involving generating functions and recurrence relations.
4. To familiarize students with algebraic structures such as semigroups, monoids, and groups, and their applications.
5. To provide a foundation in graph theory and trees, enabling analysis of structures and algorithms used in computer science.

Course Outcomes

1. Apply logical reasoning, construct truth tables, and use set theory concepts in solving computational problems.
2. Analyze and classify different types of functions and relations, and apply combinatorial principles to count and organize data.
3. Formulate and solve recurrence relations using generating functions for modeling and solving discrete problems.
4. Demonstrate an understanding of algebraic structures and apply group theory concepts, including residue arithmetic, in computational contexts.
5. Model problems using graphs and trees, and apply algorithms to identify spanning trees, planar graphs, and Hamiltonian paths.

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	1	1	1	1	1	1	2
CO2	3	3	1	1	1	1	1	1	2
CO3	3	3	2	1	1	1	1	1	3
CO4	3	2	2	1	1	1	1	1	2
CO5	3	3	3	1	1	2	2	1	3

1: Low correlation, 2: Medium correlation, 3: High correlation

UNIT- I

Fundamentals of Logic: Basic Connectives and Truth Tables, Logical Equivalence, Logical Implication, Use of Quantifiers, Definitions and the Proof of Theorems.
Set Theory and Properties of the Integers: Set and Subsets, Set Operations, and the Laws of Set theory, Counting and Venn Diagrams. The well – ordering principle, Recursive Definitions, Division Algorithm, Fundamental theorem of Arithmetic.

UNIT-II

Relations and Functions: Cartesian Product, Functions onto Functions, Special Functions, Pigeonhole Principle, Composition and Inverse Functions.
properties of relations, Partial Orders, Equivalence Relations and Partitions, Principle of Inclusion and

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Exclusion, Generalization of principle.

UNIT–III

Generating Functions: Introductory Examples, Definition And Examples, Partitions of Integers. Recurrence Relations: First – order linear recurrence relation, second – order linear homogenous recurrence relation with constant coefficients.

UNIT-IV

Algebraic Structures: Algebraic System – General Properties, Semi Groups, Monoids, Homomorphism,
Groups: Definition, Examples and Elementary properties, Residue Arithmetic.

UNIT -V

Graph Theory: Definitions and examples, sub graphs, complements and graph Isomorphism, Vertex degree, Planar graphs, Hamiltonian paths and Cycles.
Trees: Definitions, properties and Examples, Rooted Trees, Spanning Trees and Minimum Spanning Trees.

Reference Book:

Mott Joe L Mott, Abraham Kandel, and Theodore P Baker, Discrete Mathematics for Computer Scientists& Mathematicians, Prentice Hall NJ, 2nd Edition, 2015.

Suggested Reading:

1) Ralph P. Grimaldi, B.V Ramana, Discrete and Combinatorial Mathematics, 5th Edition, Pearson, 2004. (An Applied Introduction)
2) Jr. P. Tremblay and R Manohar Discrete Mathematical Structures with Applications to Computer Science, McGraw Hill, 1987.
3)R. K. Bisht and H. S. Dhami, Discrete Mathematics Oxford Higher Education, 2015
4)Bhavanari Satyanarayana, Tumurukota Venkata Pradeep Kumar and Shaik Mohiddin Shaw, Mathematical Foundation of Computer Science, BSP, 2016

1)

CA SEM I – THEORY		Hours /Week		Cr	Scheme of Examination			
					Max Marks		Duration (hrs)	
Course Code	Course Title	L	P		SEE	CIE	SEE	CIE
CC102	Computer Architecture	3	-	3	70	30	3	1

Course Objectives

1. Understand the fundamentals of digital systems, number systems, Boolean algebra, and their simplifications using Karnaugh Maps.
2. Explore the design and operation of combinational and sequential circuits such as adders, multiplexers, flip-flops, and counters.
3. Learn the basics of computer organization, instruction cycle, CPU architecture, and addressing modes.
4. Gain insight into advanced architectural concepts such as pipelining, memory hierarchy, I/O systems, and memory management.

Course Outcomes

1. Apply Boolean algebra, logic simplification techniques, and number systems to analyze and design digital circuits.
2. Design and implement combinational and sequential logic components for digital system applications.
3. Explain the architecture and functional units of a basic computer system and evaluate CPU operations and addressing schemes.
4. Analyze pipeline processing, memory systems, and input/output mechanisms used in modern computer architecture.

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	3	2	1	1	1	1	1	2
CO2	3	3	3	1	1	1	1	1	2
CO3	3	2	2	1	1	1	1	1	2
CO4	3	2	2	1	1	2	1	1	3

1: Low correlation, 2: Medium correlation, 3: High correlation

Unit-I

Fundamentals of Digital Systems and Number Representations Digital Principles: Definition for Digital signals, Digital logic, Digital computers, Von Neumann Architecture. Number Systems: Decimal, Binary, Octal, Hexadecimal, Number System Conversions, Binary Arithmetic, Addition and subtraction of BCD, Octal Arithmetic, Hexadecimal Arithmetic, Binary Codes, Decimal Codes, Error detecting and correcting codes, ASCII, EBCDIC, Excess- 3 Code, The Gray Code. Boolean Laws and Theorems.

Unit-II

K-Map: Truth Tables to K-Map, 2-variable, 3-variable and 4-variable K Map, K-Map Simplifications, Don't Care Conditions, Sum-of-Products and Product-of-Sums. Combinational Circuits: Half Adder and Full Adder, Subtractor, Decoders, Encoder, Multiplexer, De-multiplexer. Sequential Circuits: Flip-Flops- SR Flip- Flop, D Flip-Flop, J-K Flip-Flop, T Flip-Flop

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Unit-III

Register: 4-bit register with parallel load, Shift Registers-Bidirectional shift register with parallel load. Binary Counters-4-bit synchronous and Asynchronous binary counter. Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input- Output Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator logic.

Unit-IV

Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC), RISC Vs CISC. Pipeline: Arithmetic Pipeline and Instruction Pipeline

Unit-V

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, Direct memory Access, Input-Output Processor (IOP).
Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory- Memory mapping methods, Virtual Memory.

Text Books:

1. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education India, 2017.
2. M. Morris Mano, "Computer System Architecture", Pearson, Third Edition, 2007.

Reference Books:

1. William Stallings- Computer Organization and Architecture", Pearson/PHI, Seventh Edition, 2008.

BCA SEM I – THEORY		Hours /Week		Cr	Scheme of Examination			
					Max Marks		Duration (hrs)	
Course Code	Course Title	L	P		SEE	CIE	SEE	CIE
SEC101	Programming in C	3	-	3	70	30	3	1

Course Objectives

1. To provide foundational knowledge of computer systems, number systems, and the basics of C programming including variables, data types, operators, and program structure.
2. To enable students to implement conditional and loop control structures, functions, recursion, and understand storage classes in C.
3. To develop proficiency in using arrays and preprocessors for data handling and algorithm implementation.
4. To introduce advanced programming concepts like pointers and strings, and demonstrate their usage in real-world programming problems.
5. To familiarize students with structures, unions, file handling, and other advanced features in C for modular and persistent data programming.

Course Outcomes

1. Understand computer basics and write simple C programs using variables, data types, operators, and control program flow using flowcharts and number systems.
2. Apply decision-making, loop structures, and functions (including recursion) effectively in C programs, and manage variable scope with appropriate storage classes.
3. Use arrays and preprocessor directives efficiently to implement common algorithms like search and sort.
4. Demonstrate the ability to manipulate memory using pointers, handle strings, and utilize command-line arguments in real-time applications.
5. Implement structured programming using structures, unions, and file operations to manage data and input/output efficiently.

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	1	1	1	1	1	1	2
CO2	3	3	2	1	1	1	1	1	2
CO3	3	3	2	1	1	1	1	1	2
CO4	3	3	3	1	1	1	1	1	3
CO5	3	3	3	1	1	2	1	1	3

1: Low correlation, 2: Medium correlation, 3: High correlation

UNIT – I

Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts.
Number Systems: Binary, Octal, Decimal, Hexadecimal
Introduction to C Language - Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements
Arithmetic Operators and Expressions: Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.

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UNIT-II

Conditional Control Statements: Bitwise Operators, Relational and Logical Operators, If, If-Else, Switch-Statement and Examples. Loop Control Statements: For, While, Do-While and Examples. Continue, Break and Goto statements
Functions: Function Basics, User-defined Functions, Inter Function Communication, Standard Functions, Methods of Parameter Passing. **Recursion-** Recursive Functions.
Storage Classes: Auto, Register, Static, Extern, Scope Rules, and Type Qualifiers.

UNIT – III

Preprocessors: Preprocessor Commands. **Arrays** - Concepts, Using Arrays in C, Inter-Function Communication, Array Applications, Two- Dimensional Arrays, Multidimensional Arrays, Linear and Binary Search, Selection and Bubble Sort.

UNIT - IV

Pointers - Introduction, Pointers for Inter-Function Communication, Pointers to Pointers, Compatibility, L-value and R-value, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Command-line Arguments.
Strings - Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions.

UNIT - V

Structures: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self Referential Structures, Unions, Type Definition (typedef), Enumerated Types.
Input and Output: Introduction to Files, Modes of Files, Streams, Standard Library Input/Output Functions, Character Input/Output Functions.

Suggested Reading:

1. B.A. Forouzan and R.F. Gilberg, "*A Structured Programming Approach in C*" , Cengage Learning, 2007
2. Kernighan BW and Ritchie DM, "*The C Programming Language*", 2nd Edition, Prentice Hall of India, 2006.
3. Rajaraman V, "*The Fundamentals of Computer*", 4th Edition, Prentice-Hall of India, 2006.

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BCA SEM I – THEORY		Hours /Week		Cr	Scheme of Examination			
					Max Marks		Duration (hrs)	
Course Code	Course Title	L	P		SEE	CIE	SEE	CIE
SEC102	Web Technologies	3	-	3	70	30	3	1

Course Objectives

1. To introduce the fundamental components of the web including HTML5, its tags, forms, and structural elements for building static web pages.
2. To impart knowledge of CSS3 syntax, selectors, styles, and the box model to style web pages effectively.
3. To teach responsive web design principles using media queries and grid systems for cross-device compatibility.
4. To introduce the basics of JavaScript for dynamic interactions, including variables, loops, functions, arrays, DOM manipulation, and event handling.
5. To provide an overview of TypeScript, including its advanced features like interfaces, classes, modules, and JSX integration.

Course Outcomes

1. Create well-structured and accessible web pages using HTML5 elements, forms, lists, tables, and appropriate semantic tags.
2. Apply CSS3 for effective styling of web elements using various selectors and implement the box model for layout control.
3. Design and develop responsive web layouts using media queries and grid systems suitable for multiple devices and screen sizes.
4. Implement interactivity and client-side logic in web pages using JavaScript, DOM manipulation, event handling, and JSON.
5. Build robust web applications using TypeScript's strong typing, classes, interfaces, modules, and JSX support.

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	3	1	1	1	1	1	2
CO2	3	2	3	1	1	1	1	1	2
CO3	3	3	3	1	1	1	1	2	3
CO4	3	3	3	2	1	1	1	2	3
CO5	3	3	3	2	1	1	1	2	3

1: Low correlation, 2: Medium correlation, 3: High correlation

UNIT-I

Introduction to World Wide Web, Web Browsers, Web Servers, BOM, DOM, HTTP.
HTML5: Introduction, HTML5 Tags, Links, Input, Images, Lists, Tables, Creating Forms, Styling Forms, Placeholder, Inline and Block elements, Id vs Class elements.

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UNIT-II

CSS3– Basics: Need and Benefit of CSS3, CSS3 Syntax, Comments, Including CSS3 in HTML Documents (Inline, Embedded and External Style Sheets).CSS3- Selectors: Universal Selector, Element Type Selector, Id Selectors, Class Selectors, Group Selectors.
CSS3-Styles: CSS Color, CSS Background, CSS Fonts, CSS Text, CSS Links, CSS Lists, CSS Tables.CSS3-Box Model: Margin, Padding, Border, Outline, Visibility, Display, Multiple Columns.

UNIT –III

Responsive Web Design (RWD)- Introduction, Viewport, Creating Responsive Websites, Responsive Images, Responsive Texts.
RWD-Media Queries: Introduction, Media Types, Device Breakpoints.
RWD-Grid View: Introduction, grid-row, grid-column.

UNIT-IV

Introduction to Javascript, JavaScript and Forms Variables, Functions, Operators, Conditional Statements and Loops, Arrays, DOM Methods, Strings, Java Script Closures, JSON. Events Handling (Mouse Events, Keyboard Events).

UNIT-V
Introduction to TypeScript-Overview of Typescript, Interface, classes, Functions, Generics, Enums, Adv Types, Modules, JSX overview.

Suggested Reading:
1. Robert W. Sebesta, Programming the World Wide Web, 8th Edition, Pearson Education,2006.
2. Internet & World Wide Web-HOW TO PROGRAM-5th Edition, Deitel. Published by Pearson (July 14th 2021) - Copyright © 2012.
3. Yakov Fain, Anton Moiseev, TypeScript Quickly, 1st Edition, Manning Publications,2020.

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BCA SEM I – THEORY		Hours /Week		Cr	Scheme of Examination			
					Max Marks		Duration (hrs)	
Course Code	Course Title	L	P		SEE	CIE	SEE	CIE
AEC101	Effective Communication	3	-	3	70	30	3	1

Course Objectives

1. To develop an understanding of the communication process, its types, and the role of listening, speaking, reading, and writing in effective communication.
2. To enhance interpersonal skills, personality traits, time management, emotional intelligence, and team collaboration for professional success.
3. To strengthen the grammatical foundation through appropriate usage of tenses, agreement, modifiers, and prepositions.
4. To build vocabulary and improve written communication skills for academic and professional contexts, including technical and official writing.
5. To improve comprehension skills by practicing reading and understanding a variety of unseen and biographical passages.

Course Outcomes

1. Demonstrate clear understanding of the communication process and effectively apply verbal and non-verbal communication techniques in various contexts.
2. Exhibit improved interpersonal effectiveness through enhanced emotional intelligence, persuasive skills, and collaborative behaviours.
3. Apply correct grammatical structures in spoken and written English by avoiding common errors in usage and syntax.
4. Write well-structured paragraphs, essays, emails, and reports by applying appropriate vocabulary and stylistic conventions.
5. Interpret and analyse unseen passages with improved reading comprehension skills, drawing relevant inferences and ideas.

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	1	1	1	3	2	1	2	1	2
CO2	1	1	1	3	2	1	3	2	2
CO3	1	1	1	3	1	1	2	1	2
CO4	1	1	1	3	1	1	2	1	2
CO5	1	1	1	3	1	1	2	1	2

1: Low correlation, 2: Medium correlation, 3: High correlation

UNIT – I

Effective Communication: Role and importance of communication; Features of human communication; Process of communication; Barriers to communication; Oral and Written Communication; Importance of listening, speaking, reading, and writing;
Types of communication: Verbal – formal versus informal communication, one-way versus two-way communication, Non-verbal communication.

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UNIT – II

Personality Development and Interpersonal Communication: Models of interpersonal development, Johari window, Knapp's model, Styles of communication, Time management, Emotional Quotient, Teamwork, Persuasion techniques.

UNIT – III

Remedial English: Tenses, Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés.
(Note: The focus is on appropriate usage)

UNIT – IV

Vocabulary Building and Written Communication: Roots and affixes;
Words often confused: Homonyms, Homophones, Homographs; One-word substitutes;
Idiomatic usage: Idioms, Phrases, Phrasal Verbs; Synonyms; Antonyms; Paragraph writing; Précis writing; Essay writing; Official letters; E-mail etiquette;
Technical report writing: Feasibility and Progress reports.

UNIT – V

Reading Comprehension: Unseen Passages, A.P.J. Abdul Kalam, Azim Premji, Sachin Tendulkar, Sathya Nadella, Sam Pitroda
(Note: No descriptive questions to be set from this unit and only Reading Comprehension/s from unseen passages should be set in the Examination Question Papers)

Suggested Readings:

1. E. Suresh Kumar, *Engineering English*, Orient BlackSwan, 2014
2. *Language and Life A Skills Approach*, Orient Black Swan, 2018
3. Michael Swan, *Practical English Usage*. OUP, 1995
4. Ashraf Rizvi, M, *Effective Technical Communication*, Tata McGraw Hill, 2009.
5. Meenakshi Raman and Sangeeta Sharma. *Technical Communication: Principles and Practice*. OUP, 2011.

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BCA SEM I – Laboratory		Hours /Week		Cr	Scheme of Examination			
					Max Marks		Duration (hrs)	
Course Code	Course Title	L	P		SEE	CIE	SEE	CIE
CC102P	Computer Architecture Lab	-	4	2	50	25	3	2

Course Objectives

1. To provide hands-on experience in identifying and assembling various computer hardware components.
2. To develop troubleshooting skills related to RAM, motherboard, BIOS settings, and peripheral devices.
3. To gain proficiency in installing and configuring operating systems and common hardware devices like printers.
4. To understand the working of basic logic gates, combinational and sequential circuits through simulations and practical circuits.
5. To enable students to design and implement digital circuits like encoders, decoders, adders, counters, and flip-flops.

Course Outcomes

1. Identify internal components of a computer system and demonstrate PC assembly and disassembly with awareness of safety and functionality.
2. Troubleshoot and configure hardware settings including BIOS, RAM upgrades, USB, LAN, and peripheral installations.
3. Install and configure operating systems and essential hardware components like printers, understanding the overall system setup process.
4. Demonstrate the functioning of basic logic gates and verify Boolean theorems using hardware logic kits.
5. Design, simulate, and implement combinational and sequential digital circuits including adders, multiplexers, flip-flops, and counters.

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	2	1	1	1	2	1	2
CO2	3	3	3	1	1	1	2	1	2
CO3	3	3	3	1	1	1	2	1	2
CO4	3	2	2	1	1	1	1	1	2
CO5	3	3	3	1	1	1	1	1	3

1: Low correlation, 2: Medium correlation, 3: High correlation

Laboratory Experiments:
Hardware

1. Familiarize the computer system layout: marking positions of SMPS, motherboard, FDD, HDD, CD, DVD and add on cards.
2. Identify the Computer Name and Hardware Specification (RAM capacity, Processor type, HDD, 32 bit/ 64 bit)
3. Identify and troubleshoot the problems of RAM, SMPS and motherboard
4. Configure BIOS settings- disable and enable USB and LAN

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5. Adding additional RAM to the system. (expanding RAM size).
6. To Study motherboard layout of a system.
7. Demonstrate the assembly of a PC
8. Demonstration of various ports: CPU, VGA port, PS/2 (keyboard, mouse), USB, LAN, Speaker, Audio.
9. Install and configure windows OS
10. To study the installation of Printer and troubleshooting.

Software:

1. Verify logic behavior of AND, OR, NAND, NOR, EX-OR, EX-NOR, Invert and Buffer gates.
2. To study and verify NAND as a Universal Gate
3. To verify De-Morgan's theorem for 2 variables
4. Design and test of an S-R flip-flop using NAND/NOR gate.
5. Convert BCD to Excess-3 code using NAND gate
6. To Convert Binary to Grey Code
7. Verification of Truth Tables of J-K Flip-Flop using NAND/NOR gate
8. Realize Decoder and Encoder circuit using Basic Gates.
9. Design and implement the 4:1MUXusinggates.
10. Implementation of 4-Bit Parallel Adder Using7483IC.
11. Design and verify operation of half adder and full adder.
12. Design and verify operation of half subtractor.
13. Design and implement a 4bitshift register using Flip flops.
14. Implement Boolean function using logic gates in both SOP and POS
15. Design and implement a 4bit synchronous counter.
16. Design and verify 4bit asynchronous counter.

Text Books:

1. M.Morris Mano, Michael D. Ciletti "Digital Design: With a Introduction to the Verilog HDL, Fifth Edition, Pearson Prentice Hall, 2013.

BCA SEM I – Laboratory		Hours /Week		Cr	Scheme of Examination			
					Max Marks		Duration (hrs)	
Course Code	Course Title	L	P		SEE	CIE	SEE	CIE
SEC101P	Programming in C Lab	-	4	2	50	25	3	2

Course Objectives

1. To develop proficiency in writing C programs using various operators, control statements, and recursion techniques.
2. To apply C programming constructs for solving mathematical and logical problems like series expansions, number conversions, and pattern generation.
3. To introduce array manipulations, matrix operations, and string processing techniques both with and without built-in functions.
4. To implement functions for modular programming and reinforce the use of parameter passing and function return values.
5. To build practical skills in file handling operations for reading, writing, and analyzing textual and structured data.

Course Outcomes

1. Write C programs using arithmetic, logical, bitwise, and ternary operators along with control flow constructs.
2. Implement mathematical operations, pattern generation, and recursion-based logic for problem solving.
3. Manipulate arrays and matrices for tasks such as searching, sorting, mathematical operations, and statistical analysis.
4. Perform string operations using both built-in functions and manual logic, enhancing understanding of character-level data handling.
5. Develop C programs for file input/output operations including text processing and generation of formatted reports.

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	1	1	1	1	1	1	2
CO2	3	3	2	1	1	1	1	1	2
CO3	3	3	2	1	1	1	1	1	2
CO4	3	3	2	1	1	1	1	1	2
CO5	3	3	3	1	1	2	1	1	3

1: Low correlation, 2: Medium correlation, 3: High correlation

Programs

1. Write programs using arithmetic, logical, bitwise and ternary operators.
2. Write programs simple control statements: Roots of a Quadratic Equation, extracting digits of integers, reversing digits, finding sum of digit, printing multiplication tables, Armstrong numbers, checking for prime, magic number,
3. Sin x and Cos x values using series expansion
4. Conversion of Binary to Decimal, Octal, Hexa and Vice versa
5. Generating a Pascal triangle and Pyramid of numbers

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6. Recursion: Factorial, Fibonacci, GCD
7. Finding the maximum, minimum, average and standard deviation of given set of numbers using arrays
8. Reversing an array, removal of duplicates from array
9. Matrix addition, multiplication and transpose of a square matrix. using functions
10. Functions of string manipulation: inputting and outputting string, using string functions such as strlen( ), strcat( ), strcpy( ).....etc
11. Writing simple programs for strings without using string functions.
12. Finding the No. of characters, words and lines of given text file
13. File handling programs: student memo printing

BCA SEM I – Laboratory		Hours /Week		Cr	Scheme of Examination			
					Max Marks		Duration (hrs)	
Course Code	Course Title	L	P		SEE	CIE	SEE	CIE
SEC102P	Web Technologies Lab	-	4	2	50	25	3	2

Course Objectives

1. To introduce students to basic web development tools, including installation and setup of Visual Studio Code and TypeScript.
2. To develop practical skills in using HTML5 for semantic layout, multimedia integration, canvas graphics, and browser storage.
3. To apply CSS3 for effective styling of text, links, tables, and webpage backgrounds.
4. To provide hands-on experience with JavaScript-based features such as form validation, DOM manipulation, events, and geolocation.
5. To develop foundational TypeScript skills for writing and executing type-safe scripts and reusable functions.

Course Outcomes

1. Set up the web development environment using Visual Studio Code and TypeScript extensions.
2. Design responsive and semantically structured web pages using HTML5 elements, multimedia, and canvas.
3. Style and enhance the appearance of web pages using various CSS3 properties for text, links, tables, and backgrounds.
4. Implement dynamic functionality in web pages through form validation, DOM manipulation, events, geolocation, and browser storage.
5. Write and execute TypeScript programs involving arithmetic operations and functions for scalable web application development.

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	3	1	1	1	1	1	2
CO2	3	2	3	1	1	1	1	1	2
CO3	3	2	3	1	1	1	1	1	2
CO4	3	3	3	2	1	1	1	2	3
CO5	3	3	3	2	1	1	1	2	3

1: Low correlation, 2: Medium correlation, 3: High correlation

Programs

1. Visual Studio Code Installation, TypeScript Extension Installation in Visual Studio Code.
2. Create a Webpage Layout using Semantic elements.
3. Add Audio and Video element to a Webpage.
4. Drawing 2D graphics using Canvas.
5. Program to Find current location using Geolocation.
6. Example for local Storage and session Storage.
7. Styling text and fonts using CSS3 properties.

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8. Styling Lists and Links using CSS3 properties.
9. Styling tables using CSS3 properties.
10. Styling Webpage backgrounds using CSS3 properties.
11. Demonstrate Form validation.
12. Demonstrate DOM methods.
13. Demonstrate HTML events.
14. Write TypeScript code to perform arithmetic operations.
15. Demonstrate functions in Type Script.

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With effect from the academic year 2025-2026

Syllabi of Semesters II approved for 2025-26

BACHELOR OF COMPUTER APPLICATIONS (BCA)

SEMESTER- II

SNo	Course Code	Course Title	Hours/ Week		No of Credits	Scheme of Examination			
						Max Marks		Duration (hrs)	
		THEORY	L	P	Cr	SEE	CIE	SEE	CIE
1	CC103	Probability and Statistics	3	-	3	70	30	3	1
2	CC104	Data Structures	3	-	3	70	30	3	1
3	CC105	Operating Systems	3	-	3	70	30	3	1
4	SEC103	Object Oriented Programming using Java	3	-	3	70	30	3	1
5	VAC101	Indian Constitution	3	-	3	70	30	3	1
PRACTICALS									
6	CC104P	Data Structures Lab	-	4	2	50	25	3	2
7	CC105P	Operating Systems Lab	-	4	2	50	25	3	2
8	SEC103P	Object Oriented Programming using Java Lab	-	4	2	50	25	3	2
		Total	15	12	21	500	225	-	-

S. No.	Name of the Member	Signature
1	The Dean, Faculty of Engineering, OU	
2	The Dean, Faculty of Management, OU	
3	The Dean, Faculty of Commerce, OU	
4	The CBoS in CSE, OU	
5	The CBoS in Informatics, OU	
6	The Chairperson, Board of Studies in Commerce, OU	
7	Dr.B.Sujatha, Asst. Professor, Dept. of CSE, UCE, OU	
8	Dr.M.A.Hameed, Asst. Professor, Dept. of CSE, UCE,OU	
9	Mrs.E.Pragnavi, Asst. Professor, Dept. of CSE, UCE, OU	

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BCA SEM II – THEORY		Hours /Week		Cr	Scheme of Examination			
					Max Marks		Duration (hrs)	
Course Code	Course Title	L	P		SEE	CIE	SEE	CIE
CC103	Probability and Statistics	3	-	3	70	30	3	1

Course Objectives

1. To introduce the fundamentals of statistics, including data types, collection methods, classification, and graphical representation.
2. To explain the concepts and computations of central tendency, dispersion, skewness, and kurtosis for descriptive data analysis.
3. To provide a foundation in probability theory and its rules, including conditional probability and Bayes' theorem.
4. To familiarize students with random variables, probability distributions, and expectation values, including binomial, Poisson, and normal distributions.
5. To develop the ability to analyse relationships using correlation and regression, and to apply hypothesis testing methods using t-test, F-test, and chi-square test.

Course Outcomes

1. Organize, classify, and visually represent statistical data using frequency distributions, diagrams, and graphs.
2. Compute and interpret measures of central tendency, dispersion, and shape characteristics such as skewness and kurtosis.
3. Apply rules of probability, including conditional and Bayes' theorem, to solve real-life uncertainty problems.
4. Analyse and interpret discrete and continuous probability distributions, and calculate expectations for random variables.
5. Perform correlation and regression analysis, and apply small sample tests like t-test, F-test, and chi-square test for statistical inference.

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	1	1	1	1	1	1	2
CO2	3	3	1	1	1	1	1	1	2
CO3	3	3	2	1	1	1	1	1	2
CO4	3	3	2	1	1	1	1	1	2
CO5	3	3	2	1	1	2	1	1	3

1: Low correlation, 2: Medium correlation, 3: High correlation

UNIT-I

Introduction: Importance of Statistics, Concepts of Statistics, population and a sample; quantitative and qualitative data; Collection of Primary and Secondary data; Classification and Tabulation of data. Construction of Univariate and bivariate frequency distribution; Diagrammatic and Graphical representation of data.

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UNIT-II

Descriptive Statistics: Measures of central tendency: Arithmetic Mean, Median, Mode, Geometric mean, Harmonic mean; Measures of Dispersion: Range, Quartile deviation, Mean deviation, Standard deviation.
Definition of Moments; Measures of Skewness: Karl Pearson's coefficient of skewness, Bowley's coefficient of skewness; Kurtosis.

UNIT-III

Probability: Basic terminology, Mathematical probability, Statistical probability, Axiomatic approach to probability, Theorems on probability.
Conditional Probability, Multiplication theorem of probability, independent events, Pairwise/mutually independent events, Bayes' Theorem.

UNIT-IV

Random variable: Definition of a random variable, discrete and continuous random variables, functions of random variables, probability mass function and probability density function and mathematical expectation of a random variable and properties of expectation.
Probability Distributions: Binomial, Poisson and Normal Distribution.

UNIT-V

Correlation and Regression analysis: Definition of correlation, Scatter Diagram, Karl Pearson's Coefficient of correlation; Partial and Multiple correlation coefficients (for three variables); Definition of Regression, Simple Linear Regression (for 2 variables).
Small Sample Tests: Basic Definitions of testing of hypothesis; **t-Test:** t-test for single Mean, t-test for difference of Means, Paired t-test. **F-Test:** F-test for equality of two population variances. **CHI-SQUARE Test:** test for single variance (population variance) and test of independence of attributes.

Reference Book

Gupta and V.K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand & Sons,Twelfth Edition.

Suggested reading:

1. A.M. Gun, M.K. Gupta, B. Dasgupta, "Fundamentals of Statistics", Vol-1, the world press Pvt. Ltd., Kolkata.
2. William Mendenhall, Robert J. Beaver, Barbara M. Beaver, "Introduction to probability and Statistics", Thomson Brooks / Cole, Eleventh Edition, 2003.
3. Richard A. Johnson, "Probability and Statistics for Engineers", Prentice Hall of India, Seventh Edition 2005.

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BCA SEM II – THEORY		Hours /Week		Cr	Scheme of Examination			
					Max Marks		Duration (hrs)	
Course Code	Course Title	L	P		SEE	CIE	SEE	CIE
CC104	Data Structures	3	-	3	70	30	3	1

Course Objectives

1. Understand the foundational concepts and classifications of data structures and their role in efficient algorithm design.
2. Learn various linear and non-linear data structures including arrays, linked lists, stacks, queues, trees, and graphs.
3. Analyse and implement searching, sorting, and hashing techniques for data organization and retrieval.
4. Develop problem-solving skills using recursion and apply appropriate data structures to real-world problems.
5. Explore memory representation and applications of advanced data structures like AVL trees and graphs.

Course Outcomes

1. Apply appropriate data structures for problem-solving in software applications.
2. Implement and analyse the performance of various searching and sorting algorithms.
3. Design and manipulate linear data structures such as arrays, stacks, queues, and linked lists.
4. Implement non-linear data structures like trees and graphs for hierarchical and networked data.
5. Use hashing, recursion, and efficient memory management techniques to optimize data operations.

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	3	2	1	1	1	1	1	2
CO2	3	3	2	1	1	1	1	1	2
CO3	3	3	3	1	1	1	1	1	2
CO4	3	3	3	1	1	2	1	1	3
CO5	3	3	3	1	1	2	1	1	3

1: Low correlation, 2: Medium correlation, 3: High correlation

Unit I

Introduction to Data Structures: Introduction and Overview: Definition, Classification, and Operations of Data Structures, Algorithms: Complexity, Time-Space Trade-off
Arrays: Definition and Classification of Arrays, Representation of Linear Arrays in Memory, Operations: Traversing, Inserting, Deleting, Searching, Sorting, Merging
Searching: Linear Search, Binary Search, Comparison of Methods
Sorting: Bubble Sort, Selection Sort, Insertion Sort, Two-Dimensional Arrays, Representation in Memory, Matrices and Sparse Matrices, Multi-Dimensional Arrays

Unit II

Linked Lists: Definition, Comparison with Arrays, Representation, Types: Singly Linked List, Doubly Linked List, Circular Linked List, Operations: Traversing, Inserting, Deleting, Searching
Applications of Linked Lists: Addition of Polynomials
Hashing and Collision: Hashing, Hash Tables, Hash Functions, Collision and Resolution Methods: Open Addressing, Chaining

Unit III

Stacks: Definition, Representation using Arrays and Linked Lists, Operations and Applications: Arithmetic Expressions, Polish Notation, Infix to Postfix Conversion, Postfix Evaluation
Recursion: Definition, Recursive Notation, Runtime Stack, Applications: Factorial, GCD, Fibonacci Series, Towers of Hanoi
Queues: Definition, Representation using Arrays and Linked Lists, Types: Simple Queue, Circular Queue, Double-Ended Queue, Priority Queue, Operations on Simple and Circular Queues, Applications of Queues

Unit IV

Trees: Definition, Terminology, Binary Trees and their Traversal, Binary Search Tree (BST): Insertion, Deletion, Searching, Height-Balanced Trees: AVL Trees, Insertion and Deletion in AVL Trees

Unit V

Graphs: Definition and Terminology, Representation Techniques, Graph Traversal Algorithms: BFS and DFS

Text Books

1. R.B. Patel, "Expert Data Structures with C", Khanna Book Publishing Company, 2023 (AICTE Recommended Textbook)
2. Seymour Lipschutz, "Data Structures with C", Schaum's Outlines, Tata McGraw-Hill, 2011.
3. Yashavant Kanetkar, "Data Structures Through C", 4th Edition, BPB Publications, 2022.

Reference Books

1. Reema Thareja, "Data Structures Using C", Second Edition, Oxford University Press, 2014.
2. Ellis Horowitz, Sartaj Sahni, and Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, Universities Press, 2007.

Web Resources

1. **GeeksforGeeks** - Data Structures Tutorial
2. **Khan Academy** - Algorithms Course

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BCA SEM II – THEORY		Hours /Week		Cr	Scheme of Examination			
					Max Marks		Duration (hrs)	
Course Code	Course Title	L	P		SEE	CIE	SEE	CIE
CC105	Operating Systems	3	-	3	70	30	3	1

Course Objectives

1. To introduce the basic concepts, structure, and functions of operating systems, including process and CPU scheduling.
2. To explore process synchronization techniques and understand the causes, detection, and resolution of deadlocks.
3. To study memory management techniques including paging, segmentation, virtual memory, and storage management.
4. To understand file system architecture, implementation, and input/output systems within an operating system.
5. To examine the mechanisms for protection and security in operating systems, including access control and cryptographic tools.

Course Outcomes

1. Explain the fundamental components and services of operating systems, manage processes and threads, and evaluate CPU scheduling algorithms.
2. Analyse and implement synchronization mechanisms and demonstrate understanding of deadlock prevention and recovery strategies.
3. Apply concepts of memory management and virtual memory to improve system performance and manage disk storage effectively.
4. Describe the structure and management of file systems and I/O systems, including methods for file allocation and disk scheduling.
5. Evaluate and apply protection and security techniques to safeguard system resources and user data in a computing environment.

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	3	2	1	1	1	1	1	2
CO2	3	3	2	1	1	1	1	1	2
CO3	3	3	3	1	1	1	1	1	2
CO4	3	3	3	1	1	2	1	1	3
CO5	3	3	3	1	2	2	1	1	3

1: Low correlation, 2: Medium correlation, 3: High correlation

Unit I

Introduction: Definition of Operating System, Computer-System Organization, Computer- System Architecture, Operating-System Structure, Operating **System Structures**: Operating- System Services, System Calls, Types of System Calls. **Process:** Process Concept, Process Scheduling, Operations on Processes, Inter process Communication, **Threads:** Overview, Multi core Programming, Multithreading Models, Threading Issues. **CPU Scheduling:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms

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Unit II

Process Synchronization: Background, The Critical-Section Problem, Peterson'sSolution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors.

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

Unit III

Main Memory: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table.

Virtual Memory: Background, Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files, Mass-Storage Structure, Overview of Mass- Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Formatting, RAID Structure

Unit IV

File-System Interface: File Concept, Access Methods, Directory and Disk Structure, Protection.

File-System Implementation: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance.

I/O Systems: Overview, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Requests to Hardware Operations.

Unit V

Protection: Goals of Protection, Principles of Protection, Domain of Protection Access Matrix, Implementation of the Access Matrix, Access Control, Revocation of Access Rights, Capability-Based Systems.

Security: The Security Problem, Program Threats, System and Network Threats, Cryptography as a Security Tool, User Authentication.

Suggested Readings

1. Abraham Silberschatz, Peter Galvin, Greg Gagne, "Operating System Concepts", Ninth Edition, John Wiley and sons publication, 2013.
2. A. Tanenbaum, "Modern Operation Systems", Third Edition, Pearson Education, 2008.
3. William Stallings, "Operating Systems", Fifth Edition, Pearson Education, 2005.
4. Ida M. Flynn, "Understanding Operating Systems", Sixth Edition, Cengage, 2011.
5. D. M. Dhamdhere, "Operatingsystems a concept-based approach", Second Edition, McGraw-Hill, 2007

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BCA SEM II – THEORY		Hours /Week		Cr	Scheme of Examination			
					Max Marks		Duration (hrs)	
Course Code	Course Title	L	P		SEE	CIE	SEE	CIE
SEC103	Object oriented Programming using Java	3	-	3	70	30	3	1

Course Objectives

1. To introduce the fundamentals of Java programming, object-oriented principles, and how Java differs from C/C++.
2. To provide understanding of arrays, strings, inheritance, interfaces, and inner classes in Java.
3. To teach robust programming using exception handling and multithreading features in Java.
4. To enable the development of GUI-based applications using Swing, AWT, and applets, along with event handling.
5. To introduce file handling mechanisms, generics, and collection frameworks for effective data manipulation in Java.

Course Outcomes

1. Develop Java programs using classes, objects, constructors, method overloading, and basic control structures.
2. Implement arrays, string manipulations, inheritance, interfaces, and inner classes to promote reusability and modular design.
3. Write robust and concurrent Java programs using exception handling and multithreading techniques.
4. Create interactive GUI applications using Swing components and manage events and applet-based interfaces.
5. Perform file I/O operations and apply generics and collection frameworks like ArrayList and LinkedList for data management.

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	3	2	1	1	1	1	1	2
CO2	3	3	3	1	1	1	1	1	2
CO3	3	3	3	1	1	1	1	1	3
CO4	3	3	3	2	1	1	1	2	3
CO5	3	3	3	1	1	2	1	2	3

1: Low correlation, 2: Medium correlation, 3: High correlation

Unit-I

Introduction to Java: Java History – Features of java, how java differ from C and C++, Introduction to JDK and JRE, Java Primitive Types, Basic Operators, Conditional and Logical statements, Some Typical Differences Between C and Java.

Defining Classes: Adding Instance Fields and Methods, Constructors, Access Modifiers (Visibility Modes), Object Creation Examples, Method Overloading and Constructor Overloading, use of static and final keywords, Objects as parameters, Difference between local variable and instance field, Introduction to Object class, how to read user input (from keyboard).

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Unit-II

Arrays, Strings in Java: How to create and define arrays, Introduction to java.util.Array class, Difference between String & StringBuffer classes, StringTokenizer class and Wrapper classes and conversion between Objects and primitives
Inheritance, Interfaces and Packages in Java: Defining super / sub classes, Abstract classes, Method overriding, Interfaces, Using Library Interfaces, Comparable and Comparator, Creating and Defining packages.
Inner classes in Java: Types of inner classes, Creating static / non-static inner classes, Local and anonymous inner classes.

Unit-III

Exception Handling in Java: What are exceptions, writing your own exception classes, try, catch, throw, throws clauses, Difference between checked vs unchecked Exceptions, Error Vs. Exception.
Multithreading in Java: Thread and its Life cycle, how to create threads, Thread class in java, use of synchronized keyword, how to avoid deadlock.

Unit-IV

GUI Design & Event Handling: Component, Container, Color, GUI Controls, Layout Managers, Introduction to Swings, Events, Listeners, Icon interface, Writing GUI Based applications, Applets, Running Applets.

Unit-V

File Handling: Stream classes, Reader and Writer classes, File and Directory class
Generics and Frameworks: Generics, Collections Framework, Collection interfaces and classes ArrayList, LinkedList, Vector.

Suggested Reading

1. Herbert Schildt: "Java™: The Complete Reference Java", Eighth Edition, Tata McGraw Hill Publications, 2011, ISBN: 978125900246

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BCA SEM II – THEORY		Hours /Week		Cr	Scheme of Examination			
					Max Marks		Duration (hrs)	
Course Code	Course Title	L	P		SEE	CIE	SEE	CIE
VAC101	Indian Constitution	3	-	3	70	30	3	1

Course Objectives

1. Learn the basics of the constitution
2. Understand the structure of the union government
3. Comprehend the state government structure
4. Gain insights into local administration
5. Study about the election commission

Course Outcomes

1. Explain the basics of the constitution
2. Elucidate the structure of the union government
3. Elaborate the state government structure
4. Describe the local administration
5. Discuss the election commission

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	2	1	1	2	3	3	2	1	2
CO2	2	1	1	2	3	3	2	1	2
CO3	2	1	1	2	3	3	2	1	2
CO4	2	1	1	2	3	3	2	1	2
CO5	2	1	1	2	3	3	2	1	2

1: Low correlation, 2: Medium correlation, 3: High correlation

Unit 1

The Constitution - Introduction
The History of the Making of the Indian Constitution
Preamble and the Basic Structure, and its interpretation
Fundamental Rights and Duties and their interpretation
State Policy Principles

Unit 2

Union Government
Structure of the Indian Union
President – Role and Power
Prime Minister and Council of Ministers
Lok Sabha and Rajya Sabha

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Unit 3

State Government
Governor – Role and Power
Chief Minister and Council of Ministers
State Secretariat

Unit 4

Local Administration
District Administration
Municipal Corporation
Zila Panchayat

Unit 5

Election Commission
Role and Functioning
Chief Election Commissioner
State Election Commission

Suggested Readings

1. Ethics and Politics of the Indian Constitution Rajeev Bhargava Oxford University Press, New Delhi, 2008
2. The Constitution of India B.L. Fadia Sahitya Bhawan; New edition (2017)
3. Introduction to the Constitution of India DD Basu Lexis Nexis; Twenty-Third 2018 edition

Suggested Software/Learning Websites

1. https://www.constitution.org/cons/india/const.html
2. http://www.legislative.gov.in/constitution-of-india
3. https://www.sci.gov.in/constitution
4. https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/

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BCA SEM II – Laboratory		Hours /Week		Cr	Scheme of Examination			
					Max Marks		Duration (hrs)	
Course Code	Course Title	L	P		SEE	CIE	SEE	CIE
CC104P	Data Structures Lab	-	4	2	50	25	3	2

Course Objectives

1. Understand and implement fundamental data structure operations through hands-on programming.
2. Develop practical skills in handling arrays, linked lists, stacks, queues, and trees using C or C++.
3. Apply recursion to solve classic algorithmic problems like factorial, GCD, and Towers of Hanoi.
4. Implement and evaluate searching, sorting, and expression evaluation using appropriate data structures.
5. Design and test real-time data structure applications including polynomial operations and expression evaluation.

Course Outcomes

1. Implement and manipulate various linear data structures such as arrays, stacks, and queues.
2. Apply linked list operations for insertion, deletion, traversal, and polynomial arithmetic.
3. Develop recursive solutions for mathematical and algorithmic problems.
4. Construct and traverse binary search trees using preorder, inorder, and postorder methods.
5. Evaluate postfix expressions and simulate queue operations using both array and linked list representations.

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	3	1	1	1	1	1	1
CO2	3	2	3	1	1	1	1	1	1
CO3	3	3	3	1	1	1	1	1	2
CO4	3	3	3	1	1	1	1	1	2
CO5	3	3	3	1	1	1	1	1	2

1: Low correlation, 2: Medium correlation, 3: High correlation

Programs

1. Write a program for insertion and deletion operations in an array.
2. Write a program to search for an element in an array using Linear Search and Binary Search.
3. Write a program to sort an array using Bubble Sort, Selection Sort and Insertion Sort.
4. Write a program to merge two arrays.
5. Write a program to add and subtract two matrices.

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6. Write a program to multiply two matrices.
7. Write a program to insert an element into a Singly Linked List:
   (a) At the beginning
   (b) At the end
   (c) At a specified position
8. Write a program to delete an element from a Singly Linked List:
   (a) At the beginning
   (b) At the end
   (c) A specified element
9. Write a program to perform the following operations in a Doubly Linked List:
   (a) Create
   (b) Search for an element
10. Write a program to perform the following operations in a Circular Linked List:
    (a) Create
    (b) Delete an element from the end
11. Write a program to implement stack operations using an array.
12. Write a program to implement stack operations using a linked list.
13. Write a program to add two polynomials using a linked lists.
14. Write a program to evaluate a postfix expression using a stack.
15. Write a program to perform the following using recursion:
    (a) Find the factorial of a number
    (b) Find the GCD of two numbers
    (c) Solve Towers of Hanoi problem
16. Write a program to implement simple queue operations using an array.
17. Write a program to implement circular queue operations using an array.
18. Write a program to implement circular queue operations using a linked list.
19. Write a program to perform the following operations on a binary search tree.
    (a) Preorder Traversal
    (b) Inorder Traversal
    (c) Postorder Traversal
20. Write a program to perform insertion operation in a binary search tree.

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BCA SEM II – Laboratory		Hours /Week		Cr	Scheme of Examination			
					Max Marks		Duration (hrs)	
Course Code	Course Title	L	P		SEE	CIE	SEE	CIE
CC105P	Operating Systems Lab	-	4	2	50	25	3	2

Course Objectives

1. Understand the fundamental concepts of system calls and their role in operating systems.
2. Explore input/output system calls and their implementation.
3. Learn mechanisms for inter-process communication using pipes.
4. Study various CPU scheduling algorithms and their performance characteristics.
5. Examine memory management techniques through simulation of page replacement algorithms.

Course Outcomes

1. Demonstrate understanding of system and I/O system calls through practical implementation.
2. Implement inter-process communication using pipe processing techniques.
3. Analyse and simulate different CPU scheduling algorithms like FCFS, SJF, Priority, and Round Robin.
4. Simulate and compare page replacement algorithms such as FIFO, LRU, and Optimal.
5. Evaluate the efficiency and performance of different OS algorithms through hands-on experiments.

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	2	1	1	1	1	1	2
CO2	3	3	2	1	1	1	1	1	2
CO3	3	3	3	1	1	1	1	1	3
CO4	3	3	3	1	1	1	1	1	3
CO5	3	3	3	1	1	1	1	1	3

1: Low correlation, 2: Medium correlation, 3: High correlation

Programs

1. Process System Calls
2. IO System Calls
3. IPC using Pipe Processing
4. First Come First Serve Scheduling
5. Shortest job first Scheduling
6. Priority Scheduling
7. Round Robin Scheduling
8. Simulate Page Replacement Algorithms FIFO
9. Simulate Page Replacement Algorithms LRU
10. Simulate Page Replacement Algorithms OPTIMAL

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BCA SEM II – Laboratory		Hours /Week		Cr	Scheme of Examination			
					Max Marks		Duration (hrs)	
Course Code	Course Title	L	P		SEE	CIE	SEE	CIE
SEC103P	Object oriented Programming using Java	-	4	2	50	25	3	2

Course Objectives

1. Understand the fundamental control structures in programming such as conditional and looping statements.
2. Explore object-oriented programming concepts including classes, objects, methods, constructors, and arrays.
3. Develop programs using inheritance, method overloading/overriding, and abstract classes.
4. Implement exception handling, multithreading, and interfaces for robust Java applications.
5. Gain practical exposure to Java GUI development using AWT, event handling, and applet programming.

Course Outcomes

1. Write Java programs using basic control flow constructs like if-else, loops, and switch statements.
2. Apply object-oriented concepts to develop modular and reusable Java programs.
3. Demonstrate usage of arrays, strings, inheritance, and polymorphism in Java applications.
4. Implement Java features such as exception handling, threads, interfaces, and packages effectively.
5. Design interactive GUI-based applications using AWT components, layout managers, and applets.
6. Here's the **CO-PO Articulation Matrix** for your given Course Outcomes (CO1–CO5) and Program Outcomes (PO1–PO9):

CO-PO Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	2	1	1	1	1	1	2
CO2	3	3	2	1	1	1	2	1	2
CO3	3	3	2	1	1	1	2	1	2
CO4	3	3	3	2	1	1	2	2	3
CO5	2	2	3	2	1	1	2	3	3

1: Low correlation, 2: Medium correlation, 3: High correlation

Programs

1. Programs on if-else, if-else-if
2. Program on switch
3. Program on while
4. Program on for loop
5. Program on do-while

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6. Program to demonstrate class concept.
7. Program to demonstrate methods
8. Program to demonstrate method overloading
9. Program to demonstrate constructors
10. Program to demonstrate constructor overloading
11. Program to demonstrate an Array
12. Program to demonstrate multidimensional array
13. Program to demonstrate Strings
14. Program to demonstrate inheritance
15. Program to demonstrate method overriding
16. Program to demonstrate abstract class
17. Program to demonstrate reading console input
18. Program to demonstrate interfaces
19. Program to demonstrate packages
20. Program to demonstrate exceptional handling
21. Program to demonstrate creating a thread by extending Thread class
22. Program to demonstrate creating a thread by implementing Runnable interface
23. Program to demonstrate AWT controls
24. Program to demonstrate Layout Manager
25. Program to demonstrate Events
26. Program to demonstrate applets

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With effect from the academic year 2025-2026

Model Question Paper Format for CIE

BACHELOR OF COMPUTER APPLICATIONS (BCA)

CIE – I

Time: 1 hr. **Max. Marks: 20**

SECTION A

Note: i) Answer **all** of the following questions. Each one carries 2 marks (3Q x 2M=6M).
ii) BT-Bloom's Taxonomy and CO-Course Outcome

SNo	Question	BT	CO
1	Unit - I		
2	Unit - II		
3	Unit – I/II		

SECTION B

Answer **any two** of the following questions. Each question carries 7 marks. (2Q x 7M=14M)

SNo	Question	BT	CO
4	Unit - I		
5	Unit - II		
6	Unit – I/II		

BACHELOR OF COMPUTER APPLICATIONS (BCA)

Model Question Paper Format

CIE – II

Time: 1 hr. **Max. Marks: 20**

SECTION A

Note: i) Answer **all** of the following questions. Each one carries 2 marks (3Q x 2M=6M).
ii) BT-Bloom's Taxonomy and CO-Course Outcome

SNo	Question	BT	CO
1	Unit – III		
2	Unit – IV		
3	Unit – V		

SECTION B

Answer **any two** of the following questions. Each question carries 7 marks. (2Q x 7M=14M)

SNo	Question	BT	CO
4	Unit – III		
5	Unit – IV		
6	Unit – III/IV		

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Model Question Paper Format for SEE

BACHELOR OF COMPUTER APPLICATIONS (BCA)

Code No:

FACULTY OF INFORMATICS, Osmania University

B.C.A.-- Semester (R25) Examination, -------

Subject: -------

Time: 3 Hours **Max. Marks: 70**

NOTE: i) Answer all questions from Part – A, & any five questions from Part – B, choosing one question from each unit.

ii) BT-Bloom's Taxonomy and CO-Course Outcome

PART – A (10Q x 2M = 20 Marks)

SNo	Question	Marks	BT	CO
1. a	Unit- I			
b	Unit- I			
c	Unit- II			
d	Unit- II			
e	Unit- III			
f	Unit- III			
g	Unit- IV			
h	Unit- IV			
i	Unit- V			
j	Unit- V			

PART – B (5Q x 10M = 50 Marks)

SNo	Question	Marks	BT	CO
Unit-I				
2a	Theory			
2b	Theory/Problem			
	OR			
3a	Theory			
3b	Theory/Problem			
Unit-II				
4a	Theory			
4b	Theory/Problem			
	OR			
5a	Theory			
5b	Theory/Problem			
Unit-III				
6a	Theory			
6b	Theory/Problem			
	OR			
7a	Theory			
7b	Theory/Problem			
Unit-IV				
8a	Theory			
8b	Theory/Problem			
	OR			
9a	Theory			
9b	Theory/Problem			
Unit-V				
10a	Theory			
10b	Theory/Problem			
	OR			

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11a	Theory			
11b	Theory/Problem			

With effect from the academic year 2025-2026

Faculty of Informatics

RULES AND REGULATIONS
FOR
BACHELOR OF COMPUTER APPLICATIONS (BCA)
With Effect from the Academic Year 2025-26

OSMANIA UNIVERSITY,
HYDERABAD – 500 007
TELANGANA, INDIA

Dr. L.K. Suresh Kumar, CBoS, FoI

Prof K Shyamala, Dean, FoI

RULES AND REGULATIONS
FOR
BACHELOR OF COMPUTER APPLICATIONS (BCA)

Note: All the rules and regulations, herein after specified shall be read as a whole for purpose of interpretation.

I. Admission

1. A candidate admitted to the Three-year Bachelor of Computer Applications Course must have passed (10+2)/Intermediate any group (example: BiPC, MPC, CEC, HEC, Vocational courses etc.) as equivalent thereto.
2. All the eligible applicants will be admitted strictly in accordance with the merit secured at the (10+2)/Intermediate any group (example: BiPC, MPC, CEC, HEC, Vocational courses etc.) as equivalent in view the rules in force regarding the statutory reservations of seats to various categories of candidates.

II. Duration

1. The duration of the program is six semesters (three academic years): I, II, III, IV, V, and VI semesters. Each of the academic year shall comprise of two semesters. The almanac of each semester preferably be as given below:

Semester

Duration of Instruction	15 Weeks
Preparation Holidays	2 Weeks
Duration of Examinations	2/3 Weeks

- No admissions/re-admissions/promotions are to be made after the expiry of four weeks from the date of commencement of instruction.
- In case there are any Court cases consequent on which the Convener of admissions is compelled to admit any candidate after the last date of admissions, the admission (seat) of such a student be reserved for the subsequent year on supernumerary basis.
- No supplementary or any other examinations (except internal tests) shall be conducted during the instruction period of the semester.
- Candidates will be allotted to one of the courses at the time of admission, strictly depending on the merit, and subject to the rules and regulations in force from time to time, including reservations.
- A candidate admitted to the Bachelor of Computer Applications program will forfeit his/her seat and admission stands cancelled if:
    - He/She does not put in at least 40% of attendance in Semester-I, OR
    - He/She fails to fulfill all the requirements for the award of the degree as specified, within six academic years from the time of admission.

III. Rules and Regulations of Attendance

1. The degree of Bachelor of Computer Applications will be conferred on a candidate who has pursued a "regular program of study" for three academic years as hereinafter prescribed in the scheme of instruction and has passed all the examinations as prescribed in the scheme of examination.
2. A regular program of study for eligibility to appear the Examination of any semester shall mean putting in attendance of not less than 75% aggregate in lectures, practical, projects, seminars etc., in courses listed in the scheme of instruction.
3. a) In special cases and for sufficient cause shown, the Vice-Chancellor may, on the specific recommendation of the Principal/Head of the Department, condone the deficiency in attendance to the extent of 10% on medical grounds subject to submission of medical certificate. In case condonation in attendance on medical grounds is sought, the applicant shall pay the prescribed condonation fee.
   b) However, in respect of women candidates who seek condonation of attendance due to pregnancy,

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the Vice-Chancellor may condone the deficiency in attendance to the extent of 15% (as against 10% for others) on medical grounds subject to submission of medical certificate to this effect. Such condonation shall not be availed twice during the program of study.

4. Attendance of NCC/NSS camps or Inter-Collegiate/Inter-University/Inter-State/National/International Matches, Debates, Youth Festivals, Educational excursions if they form part of the curriculum or such other inter-university/inter-college activities as approved by the University will not be counted as absence. However, such absence should not exceed four weeks in a semester.
5. In any semester of the course, if a candidate fails to secure the minimum percentage of attendance, he/she shall not be eligible to appear in the examination of that semester and he/she shall have to enroll himself/herself to undergo afresh a "regular program of study" of the corresponding semester in subsequent academic session, in order to become eligible to appear for the examination.
6. The attendance shall be reckoned from the date of commencement of the instruction as per the almanac communicated by the University. However, in case of late-admitted candidates (but within the stipulated time), the attendance will be reckoned from the date of admission.
7. To enable students to know their attendance, at the end of each month, concerned Principals shall display cumulative attendance for information.
8. a) Candidates admitted to the first year through an entrance test and do not have the requisite attendance but have not less than 40% attendance can seek readmission without once again appearing for the entrance test.
   b) In respect of candidates of such programs where the admissions are governed through an entrance test, candidates of I semester who do not have the minimum 40% attendance would lose their seat and they will have to seek admission afresh by appearing at the entrance test once again.
9. If the candidate who has pursued a regular program of study of any semester wishes to undergo the same course again, he/she may be permitted to enroll again as a regular student for the course of the semester, when next offered, depending on the availability of seats, provided that he/she undertakes to forego his/her attendance secured by him/her for that semester previously, and provided further that he/she has not pursued a "regular program of study" in any higher semester other than the immediately next higher semester. For the award of division, however, he/she shall have the benefit of the higher of the aggregate marks secured in that semester.

IV. Scheme of Instruction and Examination

1. Instruction in the various subjects in each semester shall be provided by the College as per the scheme of instruction and syllabi prescribed.
2. The distribution of marks/grade based on **Continuous Internal Evaluation (CIE)** and the **Semester End Examination (SEE)** shall be as follows:

Course	Continuous Internal Evaluation (CIE)	Semester End Examination (SEE)
Each theory course	30*	70***
Each practical course for which less than six hours/week are provided in the scheme of Instruction.	25**	50
Seminar/Project Seminar	25#	---
Project	50##	100##

1. Grades are awarded based on the combined marks secured in the Semester End Examination (SEE)

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(University Exam) (Maximum 70%) and Continuous Internal Evaluation (CIE) (Maximum 30%) as per the criteria stated in the following Table:

Academic Performance in-terms of marks	Letter grade	Grade points
Marks ≥ 90%	S	10
80% ≤ Marks < 90%	A	09
70% ≤ Marks < 80%	B	08
60% ≤ Marks < 70%	C	07
50% ≤ Marks < 60%	D	06
40% ≤ Marks < 50%	E	05
Marks< 40%	F	0

*Out of 30 for CIE marks, 20 marks are to be awarded on the basis of two internal tests (each of 10 marks weightage). Remaining 10 marks to be awarded based on assignments/tutorials/quizzes etc., in the course.

- Two internal tests will be conducted in each semester.
- Each test will carry 20 marks, out of which:
  - 6 (SIX) marks for Part-A consisting of objective and short answer questions.
  - 14 (fourteen) marks for Part-B consisting of subjective questions.
- Average of two tests plus marks obtained in assignments/tutorials/quizzes etc. will be taken as CIE marks.

**Out of 25 CIE or 50 SEE marks for Practical:

- 10 or 20 marks are allotted for viva-voce exam/test.
- 15 or 30 marks for laboratory record and observation.

***The question paper will be in two parts:

- Part-A carries 20 marks:
  - Will have 10 questions, each carries 2 marks, all are compulsory and covers the entire syllabus.
- Part-B carries 50 marks:
  - Will have 5 questions, each carries 10 marks and covers all the units of the syllabus.
    - (a) Should contain five full questions of 10 marks each.
    - (b) Each question should have minimum two subdivisions, candidate has to answer either of them.
    - (c) Covering all sections of the course syllabus.

#The CIE marks for seminar and project seminar

- Will be awarded to the students by at least 2 faculty members on the basis of:
  - Oral and written presentation.
  - Their involvement in the discussion.

##Out of 50 project CIE marks:

- 25 marks to be awarded by the guide/supervisor.
- Remaining 25 marks to be awarded by the subject expert committee constituted by the concerned HOD.

###The evaluation of BCA project for maximum of 100 marks will be done as per guidelines given below:

i) 40 Marks are allocated for quality of the project work covering:
   (a) Literature review
   (b) Innovation/Originality
   (c) Methodology
   (d) Relevance/Practical application
ii) 30 Marks are allocated to Report writing/Documentation.
iii) 30 Marks are provided for candidates' performance in terms of his/her viva-voce

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examination and overall subject knowledge.

Note: A course that has only CIE marks but no SEE as per scheme is treated as Pass/Fail course for which pass marks are 40% of CIE marks.

2. The courses shall be on the semester pattern as specified earlier.
3. The distribution of the marks shall be as specified in the course structure and scheme of instruction.
4. The details of instruction period, examination and vacations shall be notified by the University in consultation with the concerned Dean.
5. The medium of instruction and examination shall be in English.
6. The examination prescribed may be conducted by means of:
   - Written papers
   - Practicals and oral tests
   - Project reports
   - Inspection of certified sessional work in laboratories
   - Or by means of any combination of these methods as may be deemed necessary.

   Candidates will be required to produce complete Lab Records of the practical work done by them in each practical examination, along with other materials prepared or collected as part of Laboratory work / Project.
7. All the general rules for examinations (given under Part IX) shall be adhered to.
8. A candidate shall be deemed to have fully passed the Examination of any semester, if he/she secured not less than the minimum marks as hereinafter prescribed.
   Minimum pass marks/grades in the SEE shall be:
   - Each Theory Course: ..... 40% of SEE — E Grade
   - Each Practical Course/Project Work: ... 50% of SEE — D Grade
9. If a candidate in any semester/examination of the course fails to secure the minimum marks in any subject, then he/she shall have to appear only in the failed subject of the semester.

V. Rules of Promotion

Rules of promotion are as follows:

<table>
<tr><th>Sl. No.</th><th>Semester/Class</th><th colspan="2">Conditions to be fulfilled for</th></tr>
<tr><td>1.</td><td>From Semester-I to Semester-II</td><td colspan="2">Regular program of study of BCA Semester-I and obtained Hall ticket for BCA Semester-I.</td></tr>
<tr><td rowspan="5">2.</td><td rowspan="5">From Semester-II to Semester-III</td><td colspan="2">a) Regular program of study of BCA Semester-II
b) Must have earned at least 50% of credits prescribed for BCA Semester-I and Semester-II. The number of credits, a candidate can have as backlogs are as under.</td></tr>
<tr><td>Number of credits prescribed for Sem-I and Sem-II</td><td>*Number of credits permitted as backlogs ≤ 50%</td></tr>
<tr><td>39/40</td><td>20</td></tr>
<tr><td>41/42</td><td>21</td></tr>
<tr><td>43/44</td><td>22</td></tr>
<tr><td>3.</td><td>From Semester-III to Semester-IV</td><td colspan="2">Regular program of study of BCA Semester-III</td></tr>
<tr><td rowspan="3">3.</td><td rowspan="3">From Semester-IV to Semester-V</td><td colspan="2">a) Regular program of study of BCA Semester-III
b) Number of backlog credits, if any of BCA I, II, III and IV Semester put together shall not exceed 50% of the total number of credits.</td></tr>
<tr><td>Number of credits prescribed for Sem-I, Sem-II, Sem-III, Sem-IV</td><td>Number of credits permitted as backlogs ≤ 50%</td></tr>
<tr><td>45/46</td><td>23</td></tr>
</table>

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		47/48	24
		49/50	25
4.	From V-Semester to VI-Semester	Regular program of study of BCA Semester-V	

Note: If the number of credits permitted as backlogs turn out to be a fraction, the credits are **rounded to the next higher digit.**

VI. Grading System

1. Candidates who have passed all the examinations of the BCA Program shall be awarded Division in accordance with the grade secured by them in all six semesters taken together, including the sessional marks secured in those semesters.
2. The grade secured shall be shown in the memorandum of marks as per the performance in SEE including CIE.
3. A minimum Cumulative Grade Point Average (CGPA) of 5 is required for the award of Degree. The consolidated memorandum of marks will reflect the credits/grade scored in each subject.
4. Semester Grade Point Average (SGPA) and CGPA Calculation:

(a) $$\text{SGPA} = \frac{\sum_i \text{Letter Grade Point} \times \text{Credits}}{\sum_i \text{Credits}}$$

SGPA is calculated upto second decimal point
SGPA is calculated only when all subjects in that semester are Cleared / Passed

(b) $$\text{CGPA} = \frac{\sum_j (\text{SGPA})_j \times (\text{Total Credits})_j}{\sum_j (\text{Total Credits})_j}$$

CGPA at a given point of Semester is calculated upto second decimal point
CGPA is calculated only when total credits earned are equal to total credits prescribed as per scheme up to a semester in which the candidate has last appeared for SEE.

(c) Pass / Fail courses are not included in computing SGPA/CGPA.

VII. Award of Degree

The degree of **Bachelor of Computer Applications** will be conferred on a candidate who has pursued a **regular program of study of three academic years** as hereinafter prescribed in the scheme of instruction and has passed all the examinations as prescribed in the scheme of examinations.

1. Award of Division

- CGPA 7.5 and above – *First Class with Distinction*
- CGPA 6.5 and above but less than 7.5 – *First Class*
- CGPA 5.5 and above but less than 6.5 – *Second Class*
- CGPA 5.0 and above but less than 5.5 – *Pass Class*

2. Award of Gold Medal

1. A student securing CGPA 7.5 and above in single attempt is eligible for award of First Class with Distinction.
2. A student securing highest CGPA in single attempt is eligible for award of Gold Medal / Rank Certificate.

Note: A student's CIE marks and SEE marks in each subject shall be shown separately in the memorandum of marks.

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VIII. Improvement of Division

A candidate who wishes to improve his/her division may do so within one academic year immediately after having passed all the examinations of the degree course, by reappearing at not more than two semesters (all subjects including practicals pertaining to the semester taken together) examinations.
Further, the candidate has to appear for improvement examination as per the scheme of instruction and syllabus in vogue at the time of taking his/her examination.
For the award of the division, he/she will have the benefit of the higher of the two aggregates of marks secured in the corresponding semester(s).

IX. General Rules of Examinations

1. All examinations of Osmania University shall be held at such places as it may be decided and at such other centers on such dates as may be notified.
2. Application for permission to appear at every examination shall be made by the candidate on the prescribed form, accompanied by three passport size full-face photographs (not profile), along with the necessary certificates and the prescribed fee.
   The application should be submitted to the concerned Principal on or before the date fixed for this purpose. The Principal, after verifying the eligibility of the candidate, forwards the application to the Controller of Examinations.
3. When a candidate's application is found in order and he/she is eligible to appear for an examination, the Controller of Examinations shall send the attested Hall Ticket with the photograph of the candidate affixed to it, to the Principal of the College.
   The Principal will issue the Hall Ticket to the candidate only if he is satisfied with all the conditions to be complied with by the candidate regarding eligibility criteria.
   The Hall Ticket issued to the candidate shall have to be produced by the candidate before entering the premises where the examination is being held or any part of the said premises, as well as to the Examination Hall.
4. A candidate, after having been declared successful in all the semester examinations of the course, shall be given a certificate setting forth the year of examination, the subjects in which he/she was examined, and the division secured.
5. No candidate shall be allowed to pursue more than one degree simultaneously.
6. Students who have appeared once at any examination of the course need not put in fresh attendance if the student wants to reappear at the corresponding examination, notwithstanding the fact that new subjects may have been introduced by the University.
   However, he/she will have to appear at the examinations according to the scheme of Examination and Syllabus in force.

X. Transitory Regulations

Whenever the course or scheme of instruction is changed in a particular year, two more examinations immediately following thereafter shall be conducted according to the old syllabus/regulations. Candidates not appearing at the examinations or failing in them shall take the examination subsequently according to the changed syllabus/regulations.

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